Serial No.: 10/625,895
Docket No.: PTGF-03043
HIR.072

REMARKS

Entry of this Amendment is proper because it narrows the issues on appeal and does not require further search by the Examiner.

Claims 1-4 and 20-31 are all the claims presently pending in the application. Claim 20 has been amended to more particularly define the invention.

It is noted that the claim amendments herein or later are not made to distinguish the invention over the prior art or narrow the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein or later should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 20-31 have been rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. Claims 1-4 and 20-31 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

With respect to the prior art rejections, claims 1-4 and 20-31, insofar as in compliance with 35 U.S.C. §112, are rejected under 35 U.S.C. §103(a) as being unpatentable over Jaskie et al. (U.S. Patent No. 5,698,941) in view of Kimura et al. (U.S. Patent No. 6,195,196) and Suehiro et al. (JP 2001-217466).

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

In an exemplary aspect, as recited in claim 1, the invention is directed to a light emitting apparatus including a light emitting element comprising a nitride semiconductor, a

phosphor that absorbs light emitted from the light emitting element and emits light with a wavelength different from that of the absorbed light, a first reflection mirror that reflects the light emitted from the light emitting element to converge the light, a second reflection mirror that has a light passing hole at a position on which the light reflected on the first reflection mirror is converged and that has a reflection surface on the side opposite to the side facing the first reflection mirror, and a phosphor layer that includes the phosphor, the phosphor layer being placed over the light passing hole and at a specific region in transparent resin that part of light passing through the light passing hole is radiated.

Another aspect of the invention, as recited in claim 20, is directed to a light emitting apparatus including a first reflector having a concave shape for converging light emitted from a light emitting element to a predetermined position, the light emitting element mounted on a first surface of a plate facing the first reflector, a second reflector provided on a second surface of the plate opposite the first surface, a light passing hole in the plate located at the predetermined position for permitting the converged light to pass through the plate, and a phosphor layer displaced from the second surface of the plate and aligned over the light passing hole, the phosphor layer comprising a phosphor that absorbs light and emits light having a wavelength different from that of the absorbed light, wherein the converged light passing through the light passing hole is incident upon the phosphor layer and at least a portion of the converged light is absorbed by the phosphor.

Conventional techniques for obtaining a light color, which is originally impossible to produce using only a semiconductor light-emitting device (LED), involve wavelength conversion. This technique involves placing at least one phosphor over or around an LED

whereby the phosphor absorbs light emitted from the LED and emits light having a different wavelength (e.g. different color) than that of the absorbed light. (Application at page 1, lines 27-29 and page 2, lines 1-6) Generally, the phosphor is mixed with an epoxy resin or silicone resin that is used to seal the LED such that the phosphor is positioned around the LED. (Application at Page 2, lines 21-23)

However, in light emitting apparatuses utilizing such conventional techniques employing wavelength conversion, problems exist in that the excitation light emitted from the phosphor and/or the light emitted from the LED is so dispersed that the light cannot be sufficiently outputted in the direction of an emission observation surface. Especially, the light returning to the LED is not sufficiently reflected in the direction of the emission observation surface. As a result, the emission efficiency of such devices is lowered. (Application at page 2, lines 24-29 and page 3, lines 1-3)

The claimed invention, on the other hand, provides a light emitting apparatus in which light dispersed in the direction opposite the emission observation surface is reflected by the reflection mirrors in the direction of the emission observation surface. Additionally, the light emitted from the LED is converged and the phosphor is placed in the convergence region. Therefore, the amount of phosphor used can be reduced. Furthermore, part of the light reflected on the reflection mirrors is extracted in the direction of the emission observations surface while passing through the phosphor. These features enhance the emission efficiency of the light emitting apparatus. (Application at page 26, lines 10-21)

Moreover, any light reflected or dispersed on the lower surface of the phosphor layer is reflected by the second reflector mirror and part of the reflected light is radiated back to the

phosphor layer. However, since the area of the phosphor layer can be minimized by converging the light incident upon it, any re-radiation or dispersion of the reflected light is slight. As such, most of the light reflected on the second reflector is outputted directly to the emission observation surface, thus further enhancing the emission efficiency of the light emitting apparatus. (Application at page 19, lines 1-16)

II. THE 35 USC §112, SECOND PARAGRAPH REJECTION

Claims 20-31 stand rejected under 35 U.S.C. §112, first paragraph for failing to comply with the written description requirement. The Examiner asserts that there is no support in the embodiment of Figures 1-3 for a phosphor layer aligned with (over) the light passing hole, as recited in claims 20 and 23. Applicant respectfully submits that Figures 1 and 2, in particular, clearly show that the phosphor layer 18a is aligned with (over) the light passing hole 35. Further, the present Application discloses that "[t]he phosphor layer 18a is placed over the light passing hole 35." (Application at page 9, lines 8-9) Clearly, the subject matter cited by the Examiner was described in the specification.

Claims 1-4 and 20-31 stand rejected under 35 U.S.C. §112, second paragraph. The Examiner asserts that the limitation of a nitride semiconductor, as recited in claim 1, is unclear as to which material is a nitride semiconductor. Applicant notes that claim 1 was previously amended to more particularly indicate "a light emitting element comprising a nitride semiconductor." Further, independent claim 20 has been amended to more clearly define that the light emitting element is mounted on the first surface of a plate and to more particularly define the predetermined position to which light is converged.

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw these rejections.

III. THE PRIOR ART REJECTIONS

The Examiner alleges that Jaskie et al. would have been combined with Kimura et al. and Suehiro et al. to form the claimed invention. However, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Applicant respectfully submits that these references would not have been combined as alleged by the Examiner. Indeed, these references are completely unrelated, and no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

In fact, Applicant submits that the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, contrary to the Examiner's allegations, none of these references teach or suggest their combination.

Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Moreover, neither Jaskie et al., nor Kimura et al., nor Suehiro et al., nor any combination thereof, teaches or suggests amongst other features, a first reflection mirror that reflects the light emitted from the light emitting element to converge the light, a second reflection mirror that has a light passing hole at a position on which the light reflected on the

first reflection mirror is converged and that has a reflection surface on the side opposite to the side facing the first reflection mirror, and a phosphor layer that includes the phosphor, the phosphor layer being placed over the light passing hole and at a specific region in transparent resin such that part of light passing through the light passing hole is radiated, as recited in independent claim 1 (hereinafter "claim 1"), and similarly in independent claim 20 (hereinafter "claim 20").

As noted above, unlike conventional methods, the claimed invention provides a light emitting apparatus in which light dispersed in the direction opposite the emission observation surface is reflected by the reflection mirrors in the direction of the emission observation surface. In particular, any light reflected or dispersed away from the emission observation surface by the phosphor layer is reflected by the second reflector mirror. While part of the reflected light is radiated back to the phosphor layer, since the area of the phosphor layer can be minimized by converging the light incident upon it, any re-radiation or dispersion of the reflected light by the phosphor is slight. As such, most of the light reflected by the second reflector is outputted directly to the emission observation surface, thus further enhancing the emission efficiency of the light emitting apparatus. Therefore, the features of the claimed invention provide a light emitting apparatus with enhanced emission efficiency.

Clearly, these features are not taught or suggested by the cited references.

A. The Jaskie et al. Reference

Jaskie et al. discloses an optical correction layer for a light emitting apparatus having gaps in brightness at the light-emitting surface. The optical correction layer includes a

plurality of optical correction regions centered over the gaps, and a plurality of optically transparent regions which overlay the remainder of the light-emitting surface. The optical correction regions include appropriately formed grooves which collect and redirect light adjacent to the gaps to cover and conceal the gaps. (Jaskie et al. at Abstract)

The Examiner concedes on page 3 of the Office Action that Jaskie et al. does not disclose a light emitting element comprising a nitride semiconductor or a phosphor layer being placed in a transparent resin, as required in claim 1. Rather, the Examiner attempts to rely on Kimura et al. and Suehiro et al. to make up the deficiencies of Jaskie et al.

However, Applicant respectfully submits that Jaskie et al. further fails to disclose, amongst other features, a first reflection mirror that reflects the light emitted from the light emitting element to converge the light, a second reflection mirror that has a light passing hole at a position on which the light reflected on the first reflection mirror is converged and that has a reflection surface on the side opposite to the side facing the first reflection mirror, and a phosphor layer that includes the phosphor, the phosphor layer being placed over the light passing hole and at a specific region in transparent resin such that part of light passing through the light passing hole is radiated, as recited in claim 1, and similarly in claim 20.

The Examiner alleges that reflective surface 824 (the left mirror) in Figure 16 teaches or suggests a first reflection mirror that reflects the light emitted from the light emitting element to converge the light, as recited in claim 1, or a first reflector comprising a concave shape for converging light emitted from the light emitting element to a predetermined position, as recited in claim 20. However, as conceded by the Examiner, Jaskie et al. fails to disclose or suggest a light emitting element.

Rather, Jaskie et al. discloses that a plurality of field emitters 200 emit a plurality of electrons 202 which impact phosphor dots 110 causing the phosphor material to emit light. (See Jaskie et al. at column 3, lines 60-64) As shown in Figure 16, light 816 emitted by the phosphor dots 808 is then reflected by reflective surface 824. (See Jaskie et al. at column 8, line 19) Clearly, the reflective surface 824 in Jaskie et al. does not converge light emitted from the light emitting element, as in independent claims 1 and 20.

The Examiner further alleges that reflective surface 824 (the right mirror) in Figure 16 teaches or suggests a second reflection mirror that has a reflection surface on the side opposite to the side facing the first reflection mirror, as recited in claim 1, and similarly in claim 20. The Examiner attempts to assert that the reflection surface of the second reflection mirror 824 (the right mirror) is on the side opposite the side facing the first reflection mirror 824 (the left mirror), because the left and right reflection mirrors do not face each other since reflection mirror 830 is located in between.

Applicant respectfully submits that the Examiner's assertions are unsupported by the reference. Jaskie et al. indicates that the curvature of the surface 824 is predetermined to cause light 816 to travel toward surface 830. (See Jaskie et al. at column 8, lines 19-21) Figure 16 of Jaskie et al. clearly shows that both the left and right reflective surfaces 824 reflect light 816 toward surface 830. Reflective surface 824 (the right mirror) inherently opposes surface 824 (the left mirror) since they both reflect light toward surface 830. The Examiner essentially concedes this point by indicating that the surfaces 824 would oppose each other if not for the surface 830 being between the two.

Clearly, Jaskie et al. makes no reference or suggestion of a second reflection mirror that has a reflection surface on the side opposite to the side facing the first reflection mirror, as in claim 1, or to a second reflector provided on a second surface of a plate opposite a first surface of the plate which faces the first reflector, as in claim 20.

The Examiner also alleges that the gap between the two 824 surfaces in Figure 16 teaches or suggests a light passing hole in the second reflection mirror at a position on which the light reflected on the first reflection mirror is converged, as recited in claim 1, and similarly in claim 20.

However, Jaskie et al. discloses that the curvature of the surface 824 is predetermined to cause light 816 to travel toward surface 830 and the light is then reflected by reflective surface 830 and travels to the outer surface 817. (See Jaskie et al. at column 8, lines 19-27) As such, light reflected by surface 824 (the left mirror) is not converged to a position of a light passing hole in the surface 824 (the right mirror), as in independent claims 1 and 20. Indeed, Jaskie et al. does not teach or suggest that the light 816 is converged on or through surface 824 (the right mirror) at all. Rather, light 816 is reflected again on surface 830 and travels to the viewing surface.

In fact, Jaskie et al. does not teach or suggest a light passing hole in surface 824 (the right mirror) in any form or manner. Indeed, the Examiner alleges that the light passing hole exists between the two surfaces (the hole between the second and third mirrors 824) and does not assert that the light passing hole is in the second reflection mirror, as in claims 1 and 20. Clearly, Jaskie et al. does not teach or suggest the light passing hole of claims 1 and 20.

The Examiner also alleges that phosphor dots 808, 810 in Figure 16 teach or suggest a phosphor layer that includes the phosphor, the phosphor layer being placed over the light passing hole and at a specific region in transparent resin such that part of light passing through the light passing hole is radiated, as in independent claim 1, or a phosphor layer aligned over said light passing hole comprising phosphor wherein the converged light passing through the light passing hole is incident upon the phosphor layer and at least a portion of the converged light is absorbed by the phosphor, as in independent claim 20.

As noted above, Jaskie et al. discloses that a plurality of field emitters 200 emit a plurality of electrons 202 which impact phosphor dots 110 causing the phosphor material to emit light. (See Jaskie et al. at column 3, lines 60-64) As shown in Figure 16, light 816 emitted by the phosphor dots 808 is then reflected by reflective surfaces 824 and 830 before traveling to the outer surface. (See Jaskie et al. at column 8, line 19) Clearly, light 816 emitted by the phosphor dots 808 and converged by the surface 824 (the left mirror) is not then incident upon the phosphor dots 808.

The Examiner alleges that Figure 1 of Jaskie et al. depicts a phosphor layer 110 being placed over the entire device and thus over the light passing hole. Figure 1 depicts a simplified, expanded view of a field emission display having spacer bars. Jaskie et al. indicates that the display 100 includes a faceplate 104 and a cathode structure 106. (See Jaskie et al. at column 3, lines 33-36) However, the phosphor dots 110 are merely over the cathode structure 106 and its attendant pixels 108 of field emitters that emit the electrons to cause the phosphor to emit light. Thus, the phosphor layer is not placed over the entire device, as alleged by the Examiner, rather only the cathode structure 106.

Further, as can be seen in Figure 9, the optical correction layer 800, such as that shown in Figure 16, is positioned on the faceplate 812 opposite the phosphor dots 808. Thus, the gap between the surfaces 824 (the left and right mirrors) cited by the Examiner remains above the phosphor dots 808 regardless of the interface between the faceplate 812 and cathode structure 106. (See Jaskie et al. at Figures 9 and 16) Additionally, there is no teaching or suggestion in Jaskie et al. of a light passing hole of any sort on the cathode structure 106. Clearly, Jaskie et al. does not teach or suggest that light passing through a light passing hole of any manner is incident upon a phosphor layer, as in claims 1 and 20.

In light of the above, Jaskie et al. fails to teach or suggest the claimed invention.

B. The Kimura et al. Reference

Kimura et al. discloses an array-type exposing device, for exposing an image forming body incorporated in an image forming apparatus, including a flat light source for emitting UV rays and a light modulator unit disposed above the flat light source so as to be associated with at least one unit area derived by dividing each pixel on the image, the light modulator unit modulating the UV ray by electromechanical operation to expose the image forming body. (Kimura et al. at Abstract)

The Examiner attempts to rely on Kimura et al. to make up for the deficiencies of Jaskie et al. Namely, the Examiner asserts that Kimura et al. discloses the use of a nitride semiconductor, as recited in claim 1.

However, Kimura et al. fails to make up for the deficiencies of Jaskie et al. described above. Indeed, neither Jaskie et al., nor Kimura et al., nor Suehiro et al., nor any combination

thereof, teaches or suggests a first reflection mirror that reflects the light emitted from the light emitting element to converge the light, a second reflection mirror that has a light passing hole at a position on which the light reflected on the first reflection mirror is converged and that has a reflection surface on the side opposite to the side facing the first reflection mirror, and a phosphor layer that includes the phosphor, the phosphor layer being placed over the light passing hole and at a specific region in transparent resin such that part of light passing through the light passing hole is radiated, as recited in claim 1, and similarly in claim 20.

Thus, even assuming arguendo that Kimura et al. may disclose the use of a nitride semiconductor, as alleged by the Examiner, there is no teaching or suggestion in Kimura et al. of a first reflection mirror that reflects the light emitted from the light emitting element to converge the light, a second reflection mirror that has a light passing hole at a position on which the light reflected on the first reflection mirror is converged and that has a reflection surface on the side opposite to the side facing the first reflection mirror, and a phosphor layer that includes the phosphor, the phosphor layer being placed over the light passing hole and at a specific region in transparent resin such that part of light passing through the light passing hole is radiated, as in Applicant's claimed invention.

These features, amongst others, allow any light reflected or dispersed away from the emission observation surface by the phosphor layer to be reflected by the reflection surface back toward the emission observation surface, thus improving the emission efficiency of the claimed invention. Indeed, the cited reference does not even recognize the desirability or benefit of providing such features. Therefore, Kimura et al. clearly does not make up for the deficiencies of Jaskie et al. and Suehiro et al.

In light of the above, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of claims 1-4 and 20-31. Therefore, the Examiner is respectfully requested to withdraw this rejection.

C. The Suehiro et al. Reference

Suehiro et al. discloses a reflection-type light-emitting device that includes light-emitting device, a lead having a mount part for mounting the light-emitting device, and a reflector, wherein the mount part includes a recessed part that is open while opposing the center of the reflection mirror on the center axis of the reflector and accommodates the light-emitting device and a phosphor in the recessed part. (Suehiro et al. at Abstract)

The Examiner attempts to rely on Suehiro et al. to make up for the deficiencies of Jaskie et al. Namely, the Examiner asserts that Suehiro et al. discloses a phosphor layer, as recited in claims 1 and 20.

However, Applicant respectfully submits that Suehiro et al. specifically fails to teach or suggest a phosphor layer, as asserted by the Examiner. Rather, Suehiro et al. discloses that a LED is placed on a center axis of a reflection mirror and covered with a phosphor-dispersed epoxy resin, thus, in operation, light from the LED is absorbed by the phosphor and light of a different wavelength (e.g. color) is radiated in all directions. (Application at page 2, lines 7-14) However, there is no teaching or suggestion in Suehiro et al. of a phosphor layer being placed over a light passing hole and at a specific region in the transparent resin such that part of light passing through the light passing hole is absorbed, as in claims 1 and 20.

Notwithstanding, Suehiro et al. fails to make up for the deficiencies of Jaskie et al. described above. Indeed, neither Jaskie et al., nor Kimura et al., nor Suehiro et al., nor any combination thereof, teaches or suggests a first reflection mirror that reflects the light emitted from the light emitting element to converge the light, a second reflection mirror that has a light passing hole at a position on which the light reflected on the first reflection mirror is converged and that has a reflection surface on the side opposite to the side facing the first reflection mirror, and a phosphor layer that includes the phosphor, the phosphor layer being placed over the light passing hole and at a specific region in transparent resin such that part of light passing through the light passing hole is radiated, as recited in claim 1, and similarly in claim 20.

Thus, even assuming arguendo that Suehiro et al. may disclose the use of a phosphor layer, as alleged by the Examiner, there is no teaching or suggestion in Kimura et al. of a first reflection mirror that reflects the light emitted from the light emitting element to converge the light, a second reflection mirror that has a light passing hole at a position on which the light reflected on the first reflection mirror is converged and that has a reflection surface on the side opposite to the side facing the first reflection mirror, and a phosphor layer that includes the phosphor, the phosphor layer being placed over the light passing hole and at a specific region in transparent resin such that part of light passing through the light passing hole is radiated, as in Applicant's claimed invention.

As noted above, these features, amongst others, allow any light reflected or dispersed away from the emission observation surface by the phosphor layer to be reflected by the reflection surface back toward the emission observation surface, thus improving the emission

efficiency of the claimed invention. Indeed, the cited reference does not even recognize the desirability or benefit of providing such features. Therefore, Suehiro et al. clearly does not make up for the deficiencies of Jaskie et al. and Suehiro et al.

In light of the above, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of claims 1-4 and 20-31. Therefore, the Examiner is respectfully requested to withdraw this rejection.

IV. CONCLUSION

In view of the foregoing, Applicant submits that claims 1-4 and 20-31, all the claims presently pending in the application, are patentably distinct over the prior art of record and are allowable, and that the application is in condition for allowance. Such action would be appreciated.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned attorney at the local telephone number listed below to discuss any other changes deemed necessary for allowance in a telephonic or personal interview.

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The Commissioner is authorized to charge any deficiency in fees, including extension of time fees, or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: August 9, 2005

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CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that I am filing this Amendment Under 37 CFR §1.116 by facsimile with the United States Patent and Trademark Office to Examiner Ori Nadav, Group Art Unit 2811 at fax number (571) 273-8300 this 9th day of August, 2005.

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